

# DR. BELL, MAN WHO MADE WIRES "TALK," HALTED BY DEATH IN PLAN TO PERFECT VISION BY PHONE

**Great Inventor Also Was at Work on Synthetic Food to Banish Fear of Famine From World When He Answered the Great Central**

**USED HIS BRILLIANT MIND TO LEARN WHY CATS NEVER FAIL TO LAND FEET FIRST**

**Study of Method of Speech for Deaf Gave First Inkling of Possibility of Communication That Resulted in Telephone**

"ARE you ready, London? New York is calling." A telephone conversation begins, with words vibrating through the ether from Broadway to the Strand. The men conversing not only hear each other distinctly, but each sees the other's reflected image.

The two men, separated by the Atlantic Ocean, virtually are face to face, chatting as though the wide stretch of rolling water was a flat-top desk.

Imaginary? Of course, it is imaginary, but it is not impossible. It is more than merely possible. Alexander Graham Bell expected that seeing by telephone will be accomplished comparatively soon.

Bell is dead, but his ideas are marching on.

His body has lain since last Friday in its rock-hewn tomb on Beinn Bhreagh Mountain at Baddeck, Nova Scotia, but other scientists have grasped the flaming torch of his thoughts.

Alexander Graham Bell and the telephone are linked inseparably in the public mind. But Mr. Bell's interests were almost as wide as science itself.

Few know of his dreams of a device through which eruptions and storms on the sun could be heard on earth. He was confident that householders in time may turn on cold air for their homes as readily as they now obtain gas or electricity.

He believed the day would come when mankind would have synthetic meats and other foodstuffs, when science would banish famine forever from the earth.

**Got Knowledge From Air as Did Franklin**

Bell, like Franklin, flew kites to further his scientific knowledge. The immortal Ben was studying electrical phenomena. The equally immortal Bell was studying aerial transportation.

The telephone inventor's life was one of happiness of achievement, of a labor of love, of a searching after knowledge of the great laws that govern this planet and the universe.

No question seemed too trifling for his mind. He once wondered why cats invariably land on their feet when falling. He obtained a number of cats and at regular intervals had them dropped from a second-story window while he gravely watched them fall with claws contracted and feet outspread.

One of Dr. Bell's most recent inventions is the "flying fish," or hydrodrome, which can rush through water at a hundred miles an hour like a gigantic daddy longlegs.

After completing his invention of the telephone and seeing his company moving toward commercial success, Dr. Bell gave little attention to his great accomplishment. His interest was concentrated on other problems.

But he looked ahead and foresaw improvements that are now being realized or that promise to materialize in a few years. Eighteen years ago he predicted the automatic exchange.

**Predicted One Exchange for Telephone Users**

"In the telephone of the future I look for connections to be made automatically," he said in 1904. "Instead of a single wire there will be a little cable of wire connecting each house with the central exchange."

"It will be possible for ten wires to do the work that a thousand now do."

"There may be a system by which the subscriber can move certain buttons and call up whom he pleases. The calls will be automatic, causing the idle wires among those in the cable to come into use automatically, and when the conversation is over the disconnection will be made automatically. I think when that can be accomplished it will do away with a vast army of telephone operators and so reduce the expense that the poorest man cannot afford to be without a telephone."

His belief in the possibility of seeing by telephone was thus expressed by Dr. Bell six years ago:

"The question is with me: Are you not some day going to see by telephone? The end has not come. I am struck by the fact that nearly all recent developments have had to do with vibration. I wonder what it may not lead to when our engineers turn their genius to some of the many other fields of the work."

**Dr. Bell Saw Reality in a Telephone Joke**

His comment on telephone sight resulted in an anecdote he had heard of Dr. Bell of an anecdote he had

voice in front of the pole of an electromagnet, a similar instrument being at the other end of the line.

A later improvement combined the steel armature and diaphragm in one by using only a diaphragm of iron or steel. This was the perfected telephone, subsequent improvements dealing chiefly with wires and cables and batteries for ringing the call bells.

Bell had toiled for months in the cellar of 100 Court street, Boston, trying to perfect a transmitter that would send sound over a wire. His first triumph came in his boarding house at 5 Exeter place, Boston, on March 10, 1876.

Bell was on the top floor of the house, Watson was on a lower floor. A wire connected the two levels. The young men had been tinkering with instruments that Bell had conceived.

sixteen years old he was teaching elocution in British schools and making experiments on the nature of sound.

He went to Canada in 1870 and in the year following proceeded to Boston, where he became professor of vocal physiology at Boston University. His system of teaching deaf-mutes was immediately recognized for its worth and he soon established a school of his own.

After school hours, Bell worked on a series of inventions that were to culminate in the telephone. He disregarded time, and often worked until 2 or 3 o'clock in the morning. He busied himself with tuning forks, magnets and batteries.

By 1874 he had evolved the idea for what he called his "harmonic telegraph." This was a device for sending several Morse messages over a single



Alexander Graham Bell sending the first long-distance telephone message

value of the telephone and Bell was acclaimed by scientists in the capitals of the Old World.

The French Government awarded him the Volta prize of 50,000 francs for his achievement. It was characteristic of the man that he applied the money, with a substantial addition from his own pocket, to founding the Volta Bureau in Washington for the increase and diffusion of knowledge relating to the deaf.

This turn in his affairs, with honors pouring in on him, came when the telephone business at last began the strides worthy of its utility. Later Dr. Bell founded, at a cost of more than \$300,000, the American Association to Pro-

**Ear of a Dead Man Played Important Part in Inventor's Phone Researches**

**MANY SCOFF, THEN PRAISE**

**Home Experiments Showed How to Keep Cool in Hot-test Weather**

it could be poured into a room or a house.

A big difficulty at once arose. Houses are not built to hold air, hot or cold. It leaks from windows, through tiny apertures in floors and walls and under sills.

In the basement of Dr. Bell's Washington home was an unused swimming pool. The tank would hold water and therefore would hold air.

From a large ice box the inventor rigged up a tube to the bottom of the tank. A fan was placed in the tube to suck the air through. As the fan began whirling, cold air flowed from the box into the tank.

When the tank was filled with refrigerated air he had his desk set in one corner of the tank and so used the artificially cooled compartment as a study.

Dr. Bell believed this method laid a foundation for a system by which eventually houses will be cooled in summer. The first requisite is an apartment built to retain air. The next step will be a supply of cold air. He held that in time householders will be able to buy cool air in the same



the inventor at the dedication of a memorial tablet in 1916



Dr. Bell and his wife at Atlantic City

cial's home. The friend had forgotten his umbrella.

The official, according to the anecdote, held up an umbrella to the transmitter and asked his friend on the other end of the wire:

"Is this yours?"

Dr. Bell chuckled over the story, but added that the obtuse official perhaps was only a few years ahead of his time.

The first spoken message projected over a wire traveled but a few yards. The Atlantic and the Pacific Coasts, the Canadian border and the Mexican Gulf territory are now linked by electrically charged wires.

The contrast between that initial message and trans-continental conversation was shown vividly with the principal figures the same in each case.

During the entire winter of 1874-1875 Bell had worked with Thomas A. Watson, a brilliant young electrician, who followed out ideas that poured from the inventor's brain.

**Dead Man's Ear Aids Developing Telephone**

Bell was working on a plan to photograph speech when he hit on principles that led to the invention of the telephone. A dead man's ear played an important part in those researches.

While planning a device to photograph speech he saw that his model was a rule analogy to the human ear. Instead of bones actuated by a membrane, as in the human ear, he had a lever of wood moved by a membrane.

He accordingly decided to modify the shape of his device to correspond with the human ear. He consulted Dr. Charles A. Blake, a distinguished aurist, of Boston, who suggested experiments with the ear of a dead man.

The thought suddenly struck the inventor that there was a great disproportion in mass between the bones of the ear and the membrane that connected them; that these bones were, relative to the membrane, very heavy and very massive.

Bell then asked himself why a piece of iron or steel could not be moved by attaching it to a heavier and stiffer membrane. Experiments proved that his reasoning was correct.

The first telephone consisted of a loosely hung reed, not attuned to a pitch, attached to the center of a stretched membrane, and vibrated by the

Finally the inventor placed his lips to the transmitter.

"Watson, come here; I want you," he said.

The words carried distinctly to the waiting Watson, who bounded up the stairs jubilantly and danced about the inventor's room in excitement.

Thirty-nine years later, Mr. Bell sat in a New York office while Watson waited at San Francisco.

"Mr. Watson, are you there?" the inventor asked.

"Indeed I am," came back the reply, which had flashed over rolling prairies, busy cities, the snowy peaks of the Rockies, broad rivers and farming lands until, in a twinkling, they had covered 3400 miles.

**Message of Years Before Flashed Over Continent**

The great inventor's mind leaped back to the day when he had summoned Watson to the top floor of the Exeter place boarding house. The opportunity was too precious to be passed over.

"Watson, come here; I want you," said Dr. Bell into the instrument, and a moment later Watson heard the words in San Francisco.

The inventor threw back his head and laughed in glee.

"He says it would take him a week to come now," said Bell, repeating his old colleague's reply.

With that historic conversation, Dr. Bell saw the dreams of his youth come true. He had used a replica of the first telephone transmitter for the chat across the continent.

On that day, January 25, 1915, there were 9,000,000 telephones in the Bell system, serving 100,000,000 persons. When he died on August 3, of this year, there were 13,000,000 telephones in the United States and Canada.

**Interest in Deaf Gave Telephone to the World**

The invention of the telephone indirectly was due to Dr. Bell's interest in the deaf and his efforts to relieve that disability, a task his father and his grandfather had worked on with success.

Dr. Bell was born in Edinburgh, Scotland, March 3, 1847, the son of Alexander Melville Bell, dean of British elocutionists and the inventor of the system of "visible speech."

As a boy Bell was educated in Edinburgh and London and acquired a smattering of music, electricity and telegraphy, besides the ordinary studies assigned the youth of that day. When

gle wire at the same time by using the law of sympathetic vibrations. He used a telegraph transmitter and receiver, an electro-magnet and a flattened piece of steel clock spring.

Early in the winter of 1874 Bell took his harmonic telegraph to the electrical workshop of Charles Williams, 109 Court street, Boston, where Watson was employed. Watson made six instruments according to Bell's instructions, and thereafter devoted most of his time to executing in brass and iron the ideas worked out by Bell.

The first occurrence that proved the young inventor was on the right track came on June 2, 1875. One of the transmitter springs of his telegraph instrument stuck. The magnetized steel generated a current that sent a faint noise over the electric wire to Bell's receiver. Thereafter it was only a question of working out details.

**First Patents Stood Test of Long Legal Battling**

On January 20, 1876, Bell filed specifications and a claim for his invention. He wrote out the specifications himself, and on them subsequently was to be reared the Bell telephone business, employing more than 200,000 persons.

On February 14, 1876, he filed an application for an American patent and was awarded patent 474,465. Few documents in American legal history have been more strongly assailed in the

courts than that patent. Rivals contended that they had invented the telephone and Bell was assailed as an impostor and worse. But after a grueling fight in the courts Bell was sustained by the United States Supreme Court.

But the attacks from rivals came only after the inventor had won public recognition of his great triumph. With his patent obtained and heartened by the famous episode in the Exeter place boarding house, Bell decided to exhibit his invention at the Philadelphia Centennial.

The telephone was regarded superciliously. It was looked on as a toy, and few saw its commercial possibilities. Bell was shoved into a corner at the exposition until Dom Pedro, the Emperor of Brazil, happened along.

Dom Pedro knew Bell as a master of acoustics and needed no persuasion to listen at a receiver while the inventor talked. The account goes that the Emperor dropped the instrument, exclaiming: "My God, it speaks!"

The Brazilian's astonishment gained new interest for the invention, and Sir William Thompson, later Lord Kelvin, carried word of it to England.

**Waged Winning Fight Against Horde of Scoffers**

Bell went from Philadelphia to Boston to persuade the public he had a practical means of instantaneous communication. Scoffers were many. Believers

were few. Incidentally, those who backed up their belief with dollars gained fortunes as a result. Some investors became multimillionaires.

In the task of drumming up enthusiasm for the telephone Bell went up and down New England, prophesying that some day men would talk as easily from Boston to New York as from one room to another.

Hard-headed Yankee farmers listened with tongues in their cheeks. They saw in it only another cat-in-the-hat device, another case of "wooden nutmegs." Later many of Bell's audiences longed to kick themselves across a forty-acre lot for their lack of faith.

The newspapers of the day reflected the almost general view, funds ran low and Bell found himself with a marvel of the ages and little money. But, one by one, telephones were installed until in August, 1877, there were 778 telephones in use.

In that month Bell and his friends decided it was time to organize the business. The Bell Telephone Association was formed with no capital and a membership of four men—Bell, Watson, Gardner G. Hubbard, the inventor's father-in-law, and Thomas Sanders, a financial backer.

The inventor himself was more concerned with his precious theories and experiments than with business, and he left the expansion of the business to his pioneer supporters. He married in 1877 and went abroad to help introduce the telephone in England.

**Had Other Problems to Engross His Mind**

His mind already was looking toward other problems and he saw the conquest of the air as the next great achievement. Before sailing for England he suggested to Watson that when the business became a matter of routine he and Watson should begin experiments with flying machines.

Men of vision in Europe saw the

note the Teaching of Speech to the Deaf. He became the author of "The Education of Deaf Children," "Memoirs on the Formation of a Deaf Variety of the Human Race" and "Lectures on the Mechanism of Speech."

**Day of Synthetic Food Predicted by Inventor**

Dr. Bell was convinced that in time human life would be sustained by synthetic foods. He said he knew of no reason why research chemists could not perfect the synthetic manufacture of foodstuffs.

"Sawdust, for example, is a waste product of our mills," he said. "It contains certain nutritive materials and chemists should be able to extract them in palatable form."

"All wood and all vegetables, even weeds, contain the chemical elements needed for food. In some cases nature supplies vegetables in a form that can be digested by man. In other cases, vegetables are not in a form suitable for the human stomach."

"We cannot digest grass as it grows. We run it through a machine—in this case, the stomach of a cow—and we eat the grass in the form of meat and cheese. But the same materials are present in grass and wood. It would be possible to obtain the nutritive elements directly through chemical manipulations."

At his home in Connecticut avenue, Washington, Dr. Bell proved that a house could be kept cool in the hottest weather.

The idea germinated while he was in the tropics. The oppressive heat made him ask himself why man could not mitigate the discomforts of high temperature.

Starting on the basis that cold air is heavier than warm air he asked why it could not be handled as other fluids that are heavier than air. He concluded that cold air could be poured into a bucket and carried about or that

manner they now obtain illuminating gas.

**Science Caused Big Aid in Character Building**

In a talk shortly before his last illness Dr. Bell expressed his convictions on the value of scientific studies in building up mentality and character.

"Study of science is character building," he said. "Science is exact knowledge. It is valuable in itself, but it is additionally valuable because it has the certain by-product of strengthening and broadening our own character."

"The man who studies science for the love of it strengthens his own morality. He is a seeker after truth and necessarily himself becomes truthful."

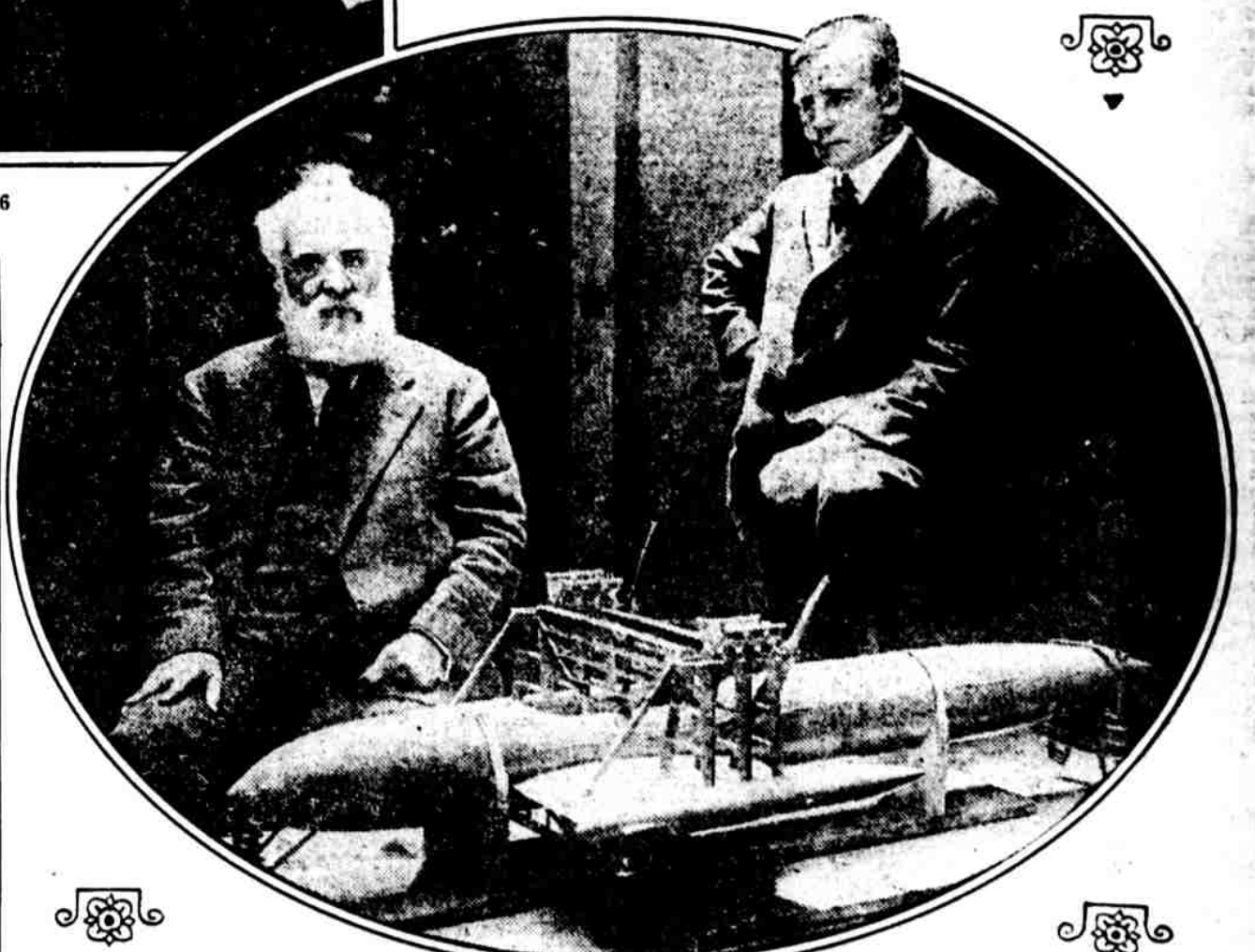
"Most boys have minds that are neglected in science. This interest often evidences itself in collections they make. These may be stamps, butterflies, shells or birds' eggs. Collections breed classifications, drawing distinctions, the beginning of scientific observation. Mathematics is the science of measures. It is essential to the scientist, but he must be more than a mathematician. Snell, taste, pain have no measure."

With all his fame and the great wealth his inventions won for him Dr. Bell was modest and unassuming.

"Great discoveries and improvements invariably involve the co-operation of many minds," he once declared. "I may perhaps take credit for having blazed the trail for the others who have come after me, but when I look at the phenomenal developments of the telephone and at the great system that

bears my name I feel that the credit for these developments are due to others rather than to myself."

"When I look back upon the past to the very beginnings of the telephone," he concluded, "I can remember men whose names were hardly ever heard of in connection with the telephone, yet by their advice and their sympathy and their financial support laid the very foundations for what we have today."



Dr. Bell and F. W. Baldwin, with whom he collaborated in his last invention, a speedboat, a model of which is shown